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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Sam Shiaw-Shiang Jiang	Examiner:	Shou, Henry K
Filing Date:	07/04/2001	Art Unit:	2664
Serial No.:	09/681,991	Docket No.:	ASTP0015USA

Title: Wireless Communications Device with a State Model

To: Commissioner for Patents
            P.O. BOX 1450
            Alexandria, VA 22313-1450

Declaration Under Rule 131(b)

As sole applicant in the above-identified patent application, I hereby make the following supplemental declaration:

1. That in May 2001, I conceived and developed the "reset and suspend state" for the "state model for acknowledged mode entities" that was later published in Section 9.3.3.5 and Figure 9.18 of the technical specification entitled "3GPP TS 25.322" version V3.7.0(2001-06), as evidenced by Change Request R2-011044, entitled "Clarification on AM states" (dated 2001-05-14) and attached herewith, and by Change Request R2-011313, entitled "Clarification on AM states" (dated 2001-05-22) and attached herewith, both of said Change Requests written by me to request changes to the pervious version V3.6.0(2001-03) of said technical specification.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued hereon.

Date: _May 21, 2004_

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Citizen of:	R.O.C.

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3GPP TSG-RAN WG2 Meeting #21
Busan, Korea, 21-25 May 2001

Tdoc R2-011313

CR-Form-v4

CHANGE REQUEST

⌘　　25.322 CR 123　⌘ ʳᵉᵛ 1 ⌘ Current version: **3.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘　(U)SIM ☐　ME/UE ☒　Radio Access Network ☒　Core Network ☐

Title:	⌘ Clarification on AM states
Source:	⌘ ASUSTeK
Work Item code: ⌘	**Date:** ⌘ 2001-05-22
Category: ⌘ F	**Release:** ⌘ R99

Use <u>one</u> of the following categories:
F (correction)
A (corresponds to a correction in an earlier release)
B (addition of feature),
C (functional modification of feature)
D (editorial modification)
Detailed explanations of the above categories can be found in 3GPP <u>TR 21.900</u>.

Use <u>one</u> of the following releases:
2　(GSM Phase 2)
R96　(Release 1996)
R97　(Release 1997)
R98　(Release 1998)
R99　(Release 1999)
REL-4　(Release 4)
REL-5　(Release 5)

Reason for change: ⌘	1. The RLC reset procedure (subclause 11.4) is not complete and clean-up is needed. 2. The behaviours of the Reset Pending State depend on whether it is entered from Acknowledged Data Transfer Ready State or from the Local Suspend State in current specification, so that the Reset Pending State is not a "pure" and "memoryless" state.
Summary of change: ⌘	1. A fifth state, the reset and suspend state, is added in the AM states. 2. The RLC reset procedure is cleaned up. **Backwards Compatibility Analysis:** There is no functionality change in this CR. It can be seen as backwards compatible but need to be considered in implementation.
Consequences if not approved: ⌘	Incomplete RLC reset procedure.

Clauses affected: ⌘	9.3.3.1-9.3.3.4, 9.3.3.5(added), 9.7.5, 11.4.2-11.4.5.3

Other specs affected:	⌘	☐ Other core specifications ⌘	
		☐ Test specifications	
		☐ O&M Specifications	

Other comments: ⌘

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specificati ons can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

CR page 2

9.3.3   State model for acknowledged mode entities

Figure 9.18 illustrates the state model for the acknowledged mode RLC entity (both transmitting and receiving). An acknowledged mode entity can be in one of following states.

9.3.3.1   Null State

In the null state the RLC entity does not exist and therefore it is not possible to transfer any data through it.

Upon reception of a CRLC-CONFIG-Req from higher layer indicating (re)establish, the RLC entity is created and the acknowledged data transfer ready state is entered.

9.3.3.2   Acknowledged Data Transfer Ready State

In the acknowledged data transfer ready state, acknowledged mode data can be exchanged between the entities. Upon reception of a CRLC-CONFIG-Req from higher layer indicating release, the RLC entity is terminated and the null state is entered.

Upon errors in the protocol, the RLC entity sends a RESET PDU to its peer and enters the reset pending state.

Upon reception of a RESET PDU, the RLC entity resets the protocol (see subclause 11.4.3), sets the hyper frame number HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) equal to the HFNI field in the RESET PDU and responds to the peer entity with a RESET ACK PDU.

Upon reception of a RESET ACK PDU, the RLC takes no action.

Upon reception of CRLC-SUSPEND-Req from upper layer, the RLC entity is suspended and the local suspend state is entered.

9.3.3.3   *Reset* Pending State

In the reset pending state the entity waits for a response from its peer entity and no data can be exchanged between the entities. Upon reception of a CRLC-CONFIG-Req from higher layer indicating release, the RLC entity is terminated and the null state is entered.

Upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, the RLC entity resets the protocol (see subclause 11.4.4), sets the hyper frame number HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) equal to the HFNI field in the RESET ACK PDU and one of the following state transitions take placeenters the acknowledged data transfer ready state.

~~The RLC entity enters the acknowledged data transfer ready state if Reset Pending State was entered from Acknowledged Data Transfer Ready State or if Reset Pending State was entered from Local Suspend State and a CRLC-RESUME-Req was received in Reset Pending State.~~

~~The RLC entity enters into Local Suspend State if Reset Pending State was entered from Local Suspend State or if Reset Pending State was entered from Acknowledged Data Transfer Ready State and a CRLC-SUSPEND-Req was received in Reset Pending State.~~

Upon reception of a RESET ACK PDU with a different RSN value as in the corresponding RESET PDU the RESET ACK PDU is discarded.

Upon reception of a RESET PDU, the RLC entity resets the protocol (see subclause 11.4.3), sets the hyper frame number HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) equal to the HFNI field in the RESET PDU, sends a RESET ACK PDU and stays in the reset pending state.

Upon reception of CRLC-SUSPEND-Req from upper layer, the RLC entity is suspended and the reset and suspend state is entered.
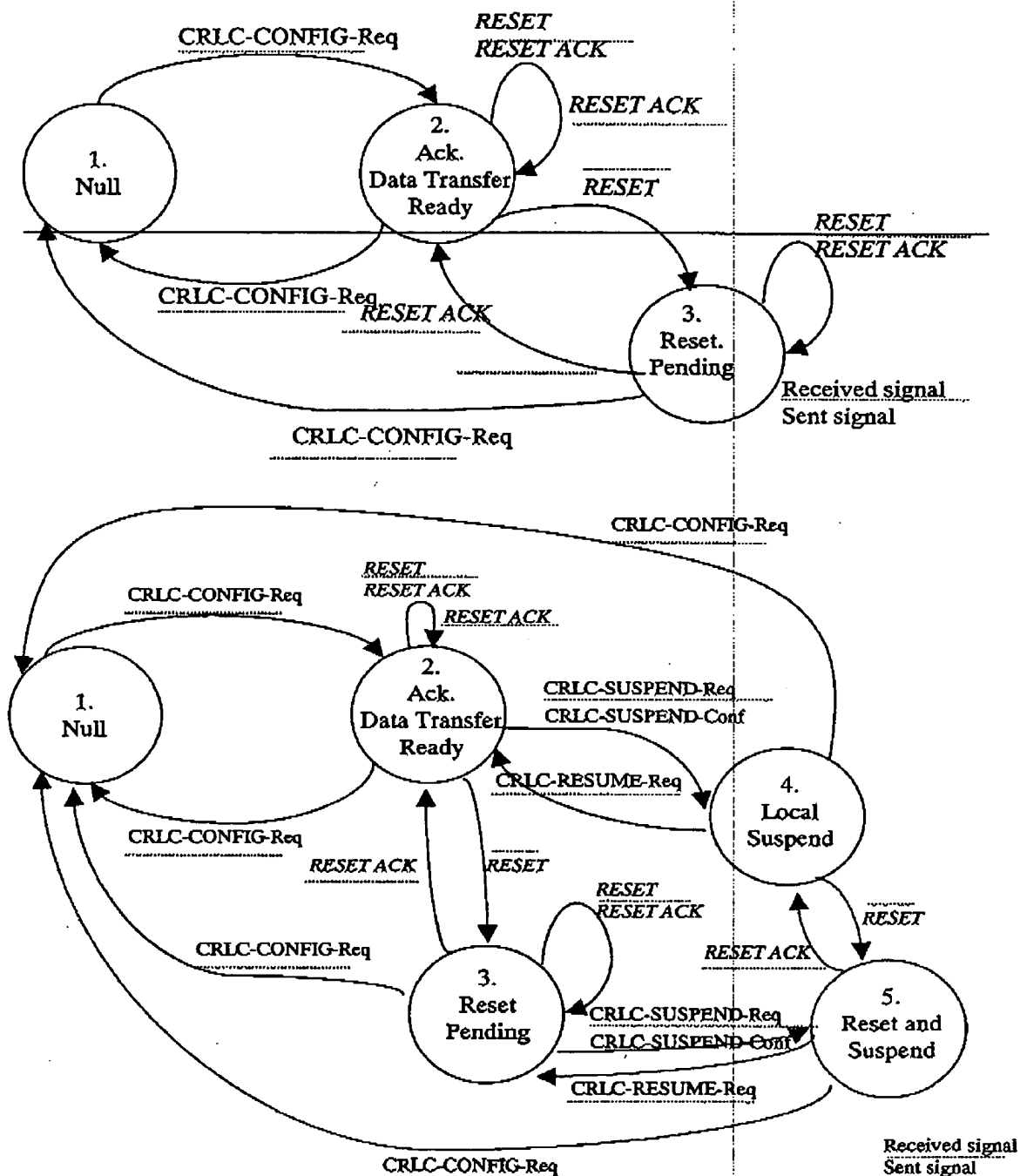
Figure 9.18: The state model for the acknowledged mode entitles when reset is performed

9.3.3.4   Local Suspend State

Upon reception of a CRLC-SUSPEND-Req from higher layer (RRC) in Acknowledge Data Transfer Ready State the RLC entity is suspended and the Local Suspend state is entered. In the Local Suspend state RLC shall not send an RLC-PDUs with SN≥VT(S)+N, where VT(S) is the value of the send state variable when the CRLC-SUSPEND-Req with parameter N was received. Upon reception of CRLC-RESUME-Req from higher layer (RRC) in this state, the RLC

entity is resumed and the Acknowledged Data Transfer Ready state is entered. Upon reception of CRLC-CONFIG-Req from upper layer indicating release, the RLC entity is terminated and the null state is entered.

Upon errors in the protocol, the RLC entity sends a RESET PDU to its peer and enters the reset and suspend state.

9.3.3.5　　Reset and Suspend Pending State

In the reset and suspend state the entity waits for a response from its peer entity and no data can be exchanged between the entities. Upon reception of CRLC-CONFIG-Req from upper layer indicating release, the RLC entity is terminated and the null state is entered.

Upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, the RLC entity resets the protocol (see subclause 11.4.4), sets the hyper frame number HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) equal to the HFNI field in the RESET ACK and enters the local suspend state.

Upon reception of CRLC-RESUME-Req from upper layer in this state, the RLC entity is resumed and the reset pending state is entered.
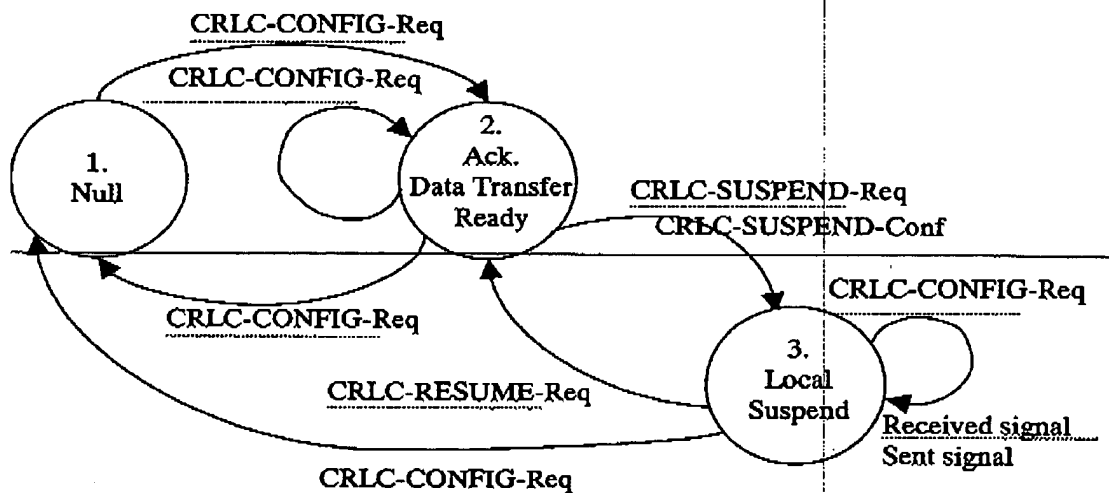

Figure 9.19: The state model for the acknowledged mode entities when local suspend is performed

9.7.5 Local Suspend function for acknowledged and unacknowledged mode

The higher layer (RRC) may suspend the RLC entity. The CRLC-SUSPEND-Req indicates this request. The RLC entity shall, when receiving this request, not send RLC PDUs with SN≥VT(S)+N for AM and SN≥VT(US)+N for UM ,where N is given by the CRLC_SUSPEND-Req primitive. The RLC entity shall acknowledge the CRLC-SUSPEND-Req ordering a suspend with a CRLC-SUSPEND-Conf with the current value of VT(S) for AM and VT(US) for UM. The suspend state is left wWhen a CRLC-RESUME-Req primitive indicating resume is received, the AM RLC entity enters the acknowledged data transfer ready state if it is in the local suspend state and enters the reset pending state if it is in the reset and suspend state.

9.7.6 RLC stop, RLC Continue function

The higher layer may stop the RLC entity. The stop parameter in the CRLC-CONFIG-Req primitive indicates this request. The RLC entity shall, when receiving this request, not submit any RLC PDUs to lower layer or receive any RLC PDUs. The data transmission and reception is continued when the continue parameter in the CRLC-CONFIG-Req primitive is received. If the continue parameter is received when the RLC entity is not stopped, no action shall be taken.

When the RLC entity is stopped, the RLC timers are not affected. Triggered polls and status transmissions are delayed until the RLC entity is continued.

11.4   RLC reset procedure

11.4.1   Purpose

The RLC reset procedure is used to reset two RLC peer entities, which are operating in acknowledged mode.
Figure 11.4 below illustrates the elementary procedure for an RLC reset. The sender can be either the UE or the
network and the receiver is either the network or the UE. During the reset procedure the hyper frame numbers (HFN) in
UTRAN and UE are synchronised. Two HFNs used for ciphering needs to be synchronised, DL HFN in downlink and
UL HFN in uplink. In the reset procedure, the highest UL HFN and DL HFN used by the RLC entity are exchanged
between UE and UTRAN. After the reset procedure is terminated, the UL HFN and DL HFN shall be increased with
one in both UE and UTRAN, and the updated HFN values shall be used after the reset procedure.
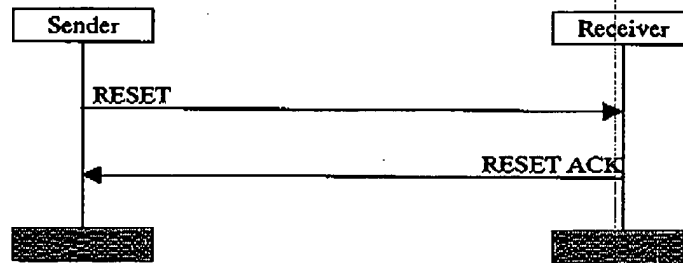

Figure 11.4: RLC reset procedure

11.4.2   Initiation

The procedure shall be initiated when a protocol error occurs.

The sender sends the RESET PDU, enters reset pending state when it is-was in data transfer ready state, and enters reset-
reset and suspend pending-state when it was in local suspend state. The sender shall start the timer Timer_RST and
increase VT(RST) with 1. The RESET PDU shall be transmitted on the DCCH logical channel if the sender is located in
the control plane and on the DTCH if it is located in the user plane.

The RESET PDU has higher priority than data PDUs.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same
RSN value as in the corresponding RESET PDU, i.e., a reset procedure is not interrupted by the reception of a RESET
PDU from the peer entity.

11.4.2.1   RESET PDU contents to set

The size of the RESET PDU shall be equal to one of the allowed PDU sizes. The hyper frame number indicator field
(HFNI) shall be set equal to the currently used HFN (DL HFN when the RESET is sent by UTRAN or UL HFN when
the RESET is sent by the UE). The RSN field shall indicate the sequence number of the RESET PDU. This sequence
number is incremented every time a new RESET PDU is transmitted, but not when a RESET PDU is retransmitted.

11.4.3   Reception of the RESET PDU by the receiver

Upon reception of a RESET PDU the receiver shall respond with a RESET ACK PDU. The receiver resets the state
variables in 9.4 to their initial value and resets configurable parameters to their configured value. Both the transmitter
and receiver side of the AM RLC entity are reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC
SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded.

When a RESET PDU is received, the receiver shall set the HFN (DL HFN when the RESET is received in UE or UL
HFN when the RESET is received in UTRAN) equal to the HFNI field in the received RESET PDU.

The RESET ACK PDU shall be transmitted on the DCCH logical channel if the sender is located in the control plane
and on the DTCH if it is located in the user plane.

The RESET ACK PDU has higher priority than data PDUs.

11.4.3.1   RESET ACK PDU contents to set

The size of the RESET ACK PDU shall be equal to one of the allowed PDU sizes. The RSN field shall always be set to the same value as in the corresponding RESET PDU. The hyper frame number indicator field (HFNI) shall be set equal to the currently used HFN (DL HFN when the RESET ACK is sent by UTRAN or UL HFN when the RESET ACK is sent by the UE).

11.4.4   Reception of the RESET ACK PDU by the sender

When the sender is in reset pending state or reset and suspend state and receives a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU the Timer_RST shall be stopped and the value of the HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) shall be set equal to the HFNI field in the received RESET ACK PDU. The sender resets the state variables in 9.4 to their initial value and resets configurable parameters to their configured value. Both the transmitter and receiver side of the AM RLC entity is reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded.

The sender shall enter data transfer ready state if it was in reset pending state and enter local suspend state if it was in reset and suspend state.

Upon reception of a RESET ACK PDU with a different RSN value as in the corresponding RESET PDU the RESET ACK PDU is discarded.

Upon reception of a RESET ACK PDU in data transfer ready state or local suspend state, the RESET ACK PDU is discarded.

11.4.5   Abnormal cases

11.4.5.1   Timer_RST timeout

Upon expiry of Timer_RST the sender shall retransmit the RESET PDU and increase VT(RST) with 1. In the retransmitted RESET PDU the value of the RSN field shall not be incremented.

11.4.5.2   Unrecoverable error (VT(RST) ≥ MaxRST)

If VT(RST) becomes larger or equal to MaxRST, unrecoverable error shall be indicated to higher layer.

11.4.5.3   Reception of the RESET PDU by the sender

Upon reception of a RESET PDU in acknowledged data ready state, reset pending state, local suspend state or reset and suspend state, the sender shall respond with a RESET ACK PDU. The sender resets the state variables in 9.4 to their initial value, resets configurable parameters to their configured value. However, VT(RST) and Timer_RST are not reset. Both the transmitter and receiver side of the AM RLC entity are reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded. The hyper frame number, HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) is set equal to the HFNI field in the received RESET PDU. The sender shall stay in the reset pending its current state. The sender shall enter data transfer ready state or local suspend state only upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU when it is in reset pending state or reset and suspend state respectively.

3GPP TSG-RAN WG2 Meeting #21
Busan, Korea, 21-25 May 2001

Tdoc R2-011044

CR-Form-v4

CHANGE REQUEST

⌘   **25.322 CR 123** ⌘ ev _ ⌘ Current version: **3.6.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘ Clarification on AM states
Source:	⌘ ASUSTeK
Work item code: ⌘	**Date:** ⌘ 2001-05-14

Category: ⌘ F

Use <u>one</u> of the following categories:
  F *(correction)*
  A *(corresponds to a correction in an earlier release)*
  B *(addition of feature),*
  C *(functional modification of feature)*
  D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP <u>TR 21.900</u>.

Release: ⌘ R99

Use <u>one</u> of the following releases:
  2   *(GSM Phase 2)*
  R96 *(Release 1996)*
  R97 *(Release 1997)*
  R98 *(Release 1998)*
  R99 *(Release 1999)*
  REL-4 *(Release 4)*
  REL-5 *(Release 5)*

Reason for change: ⌘ 1. The RLC reset procedure (subclause 11.4) is not complete and clean-up is needed.
2. The behaviours of the Reset Pending State depend on whether it is entered from Acknowledged Data Transfer Ready State or from the Local Suspend State in current specification, so that the Reset Pending State is not a "pure" and "memoryless" state.

Summary of change: ⌘ 1. A fifth state, the reset and suspend state, is added in the AM states.
2. The RLC reset procedure is cleaned up.

Consequences if not approved: ⌘ Incomplete RLC reset procedure.

Clauses affected: ⌘ 9.3.3.1-9.3.3.4, 9.3.3.5(added), 9.7.5, 11.4.2-11.4.5.3

Other specs affected: ⌘	☐	Other core specifications ⌘
	☐	Test specifications
	☐	O&M Specifications

Other comments: ⌘

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CR page 1

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

CR page 2

PAGE 24/30 * RCVD AT 5/24/2004 11:03:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/2 * DNIS:8729314 * CSID:8064986673 * DURATION (mm-ss):14-02

9.3.3   State model for acknowledged mode entities

Figure 9.18 illustrates the state model for the acknowledged mode RLC entity (both transmitting and receiving). An acknowledged mode entity can be in one of following states.

9.3.3.1   Null State

In the null state the RLC entity does not exist and therefore it is not possible to transfer any data through it.

Upon reception of a CRLC-CONFIG-Req from higher layer ~~with parameter E/R~~ indicating (re)establish, the RLC entity is created and the acknowledged data transfer ready state is entered.

9.3.3.2   Acknowledged Data Transfer Ready State

In the acknowledged data transfer ready state, acknowledged mode data can be exchanged between the entities. Upon reception of a CRLC-CONFIG-Req from higher layer indicating release, the RLC entity is terminated and the null state is entered.

Upon errors in the protocol, the RLC entity sends a RESET PDU to its peer and enters the reset pending state.

Upon reception of a RESET PDU, the RLC entity resets the protocol (see subclause 11.4.3), sets the hyper frame number HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) equal to the HFNI field in the RESET PDU and responds to the peer entity with a RESET ACK PDU.

Upon reception of a RESET ACK PDU, the RLC takes no action.

Upon reception of CRLC-SUSPEND-Req from ~~higher~~upper layer ~~with parameter N~~, the RLC entity is suspended and the local suspend state is entered.

9.3.3.3   *Reset* Pending State

In the reset pending state the entity waits for a response from its peer entity and no data can be exchanged between the entities. Upon reception of a CRLC-CONFIG-Req from higher layer ~~with parameter E/R~~ indicating release, the RLC entity is terminated and the null state is entered.

Upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, the RLC entity resets the protocol (see subclause 11.4.4), sets the hyper frame number HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) equal to the HFNI field in the RESET ACK PDU and ~~one of the following state transitions take place~~enters the acknowledged data transfer ready state.

~~The RLC entity enters the acknowledged data transfer ready state if Reset Pending State was entered from Acknowledged Data Transfer Ready State or if Reset Pending State was entered from Local Suspend State and a CRLC-RESUME-Req was received in Reset Pending State.~~

~~The RLC entity enters into Local Suspend State if Reset Pending State was entered from Local Suspend State or if Reset Pending State was entered from Acknowledged Data Transfer Ready State and a CRLC-SUSPEND-Req was received in Reset Pending State.~~

Upon reception of a RESET ACK PDU with a different RSN value as in the corresponding RESET PDU the RESET ACK PDU is discarded.

Upon reception of a RESET PDU, the RLC entity resets the protocol (see subclause 11.4.3), sets the hyper frame number HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) equal to the HFNI field in the RESET PDU, sends a RESET ACK PDU and stays in the reset pending state.

Upon reception of CRLC-SUSPEND-Req from ~~higher~~upper layer ~~with parameter N in this state~~, the RLC entity is suspended and the reset and suspend ~~pending~~state is entered.
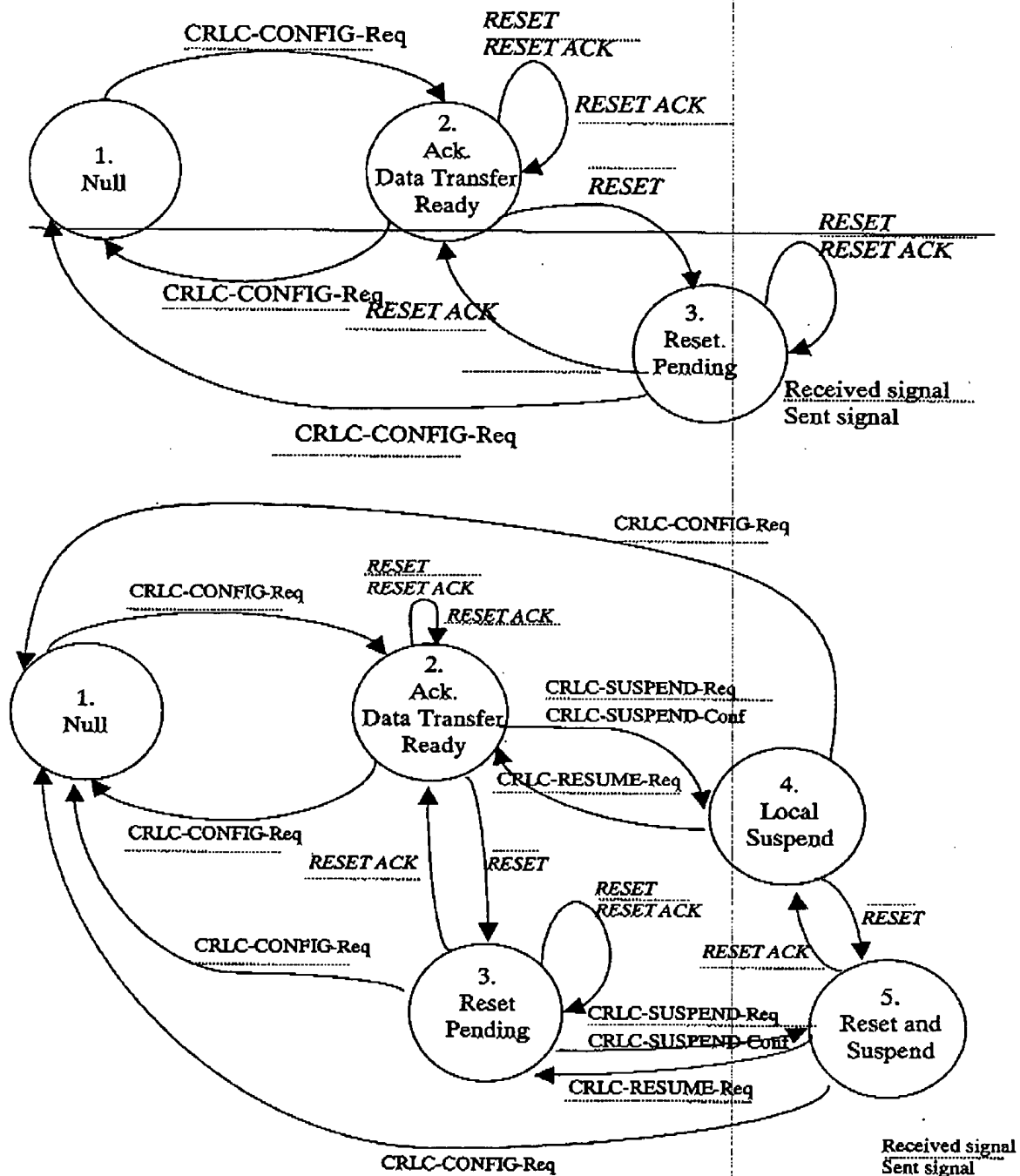
Figure 9.18: The state model for the acknowledged mode entities when reset is performed

9.3.3.4 Local Suspend State

~~Upon reception of a CRLC-SUSPEND-Req from higher layer (RRC) in Acknowledge Data Transfer Ready State the RLC entity is suspended and the Local Suspend state is entered.~~ In the Local Suspend state RLC shall not send an RLC-PDUs with $SN \geq VT(S)+N$, where $VT(S)$ is the value of the send state variable when the CRLC-SUSPEND-Req with parameter N was received. Upon reception of CRLC-RESUME-Req from higher layer (RRC) in this state, the RLC

entity is resumed and the Acknowledged Data Transfer Ready state is entered. Upon reception of CRLC-CONFIG-Req from upper layer ~~with parameter E/R~~ indicating release, the RLC entity is terminated and the null state is entered.

Upon errors in the protocol, the RLC entity sends a RESET PDU to its peer and enters the reset and suspend ~~pending~~ state.

9.3.3.5   Reset and Suspend ~~Pending~~ State

In the reset and suspend ~~pending~~ state the entity waits for a response from its peer entity and no data can be exchanged between the entities. Upon reception of CRLC-CONFIG-Req from upper layer ~~with parameter E/R~~ indicating release, the RLC entity is terminated and the null state is entered.

Upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, the RLC entity resets the protocol (see subclause 11.4.4), sets the hyper frame number HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) equal to the HFNI field in the RESET ACK and enters the local suspend state.

Upon reception of CRLC-RESUME-Req from upper layer in this state, the RLC entity is resumed and the reset pending state is entered.
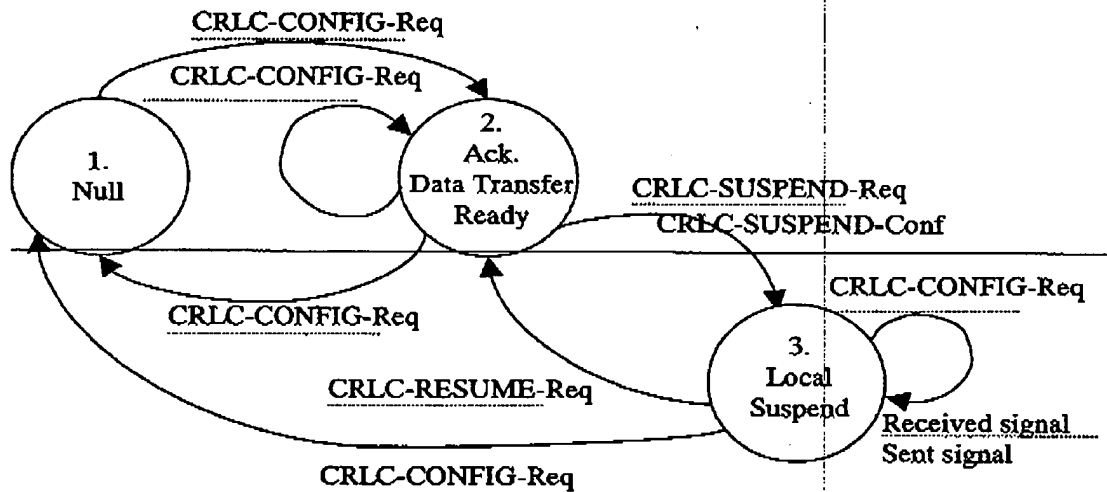

~~Figure 9.19: The state model for the acknowledged mode entities when local suspend is performed~~

9.7.5   Local Suspend function for acknowledged and unacknowledged mode

The higher layer (RRC) may suspend the RLC entity. The CRLC-SUSPEND-Req indicates this request. The RLC entity shall, when receiving this request, not send RLC PDUs with SN≥VT(S)+N for AM and SN≥VT(US)+N for UM ,where N is given by the CRLC_SUSPEND-Req primitive. The RLC entity shall acknowledge the CRLC-SUSPEND-Req ordering a suspend with a CRLC-SUSPEND-Conf with the current value of VT(S) for AM and VT(US) for UM. ~~The suspend state is left w~~When a CRLC-RESUME-Req primitive indicating resume is received, the AM RLC entity enters the acknowledged data transfer ready state if it is in the local suspend state and enters the reset pending state if it is in the reset and suspend ~~pending~~ state.

9.7.6   RLC stop, RLC Continue function

The higher layer may stop the RLC entity. The stop parameter in the CRLC-CONFIG-Req primitive indicates this request. The RLC entity shall, when receiving this request, not submit any RLC PDUs to lower layer or receive any RLC PDUs. The data transmission and reception is continued when the continue parameter in the CRLC-CONFIG-Req primitive is received. If the continue parameter is received when the RLC entity is not stopped, no action shall be taken.

When the RLC entity is stopped, the RLC timers are not affected. Triggered polls and status transmissions are delayed until the RLC entity is continued.

11.4 RLC reset procedure

11.4.1 Purpose

The RLC reset procedure is used to reset two RLC peer entities, which are operating in acknowledged mode.
Figure 11.4 below illustrates the elementary procedure for an RLC reset. The sender can be either the UE or the
network and the receiver is either the network or the UE. During the reset procedure the hyper frame numbers (HFN) in
UTRAN and UE are synchronised. Two HFNs used for ciphering needs to be synchronised, DL HFN in downlink and
UL HFN in uplink. In the reset procedure, the highest UL HFN and DL HFN used by the RLC entity are exchanged
between UE and UTRAN. After the reset procedure is terminated, the UL HFN and DL HFN shall be increased with
one in both UE and UTRAN, and the updated HFN values shall be used after the reset procedure.
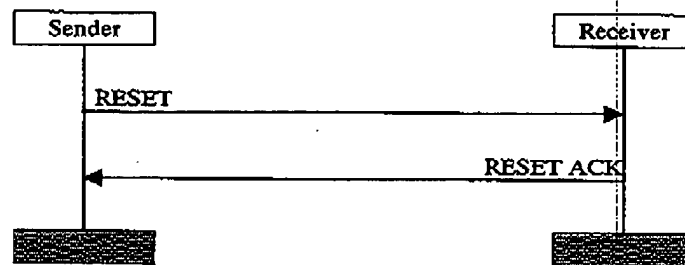

Figure 11.4: RLC reset procedure

11.4.2 Initiation

The procedure shall be initiated when a protocol error occurs.

The sender sends the RESET PDU, enters reset pending state when it is was in data transfer ready state, and enters reset-
reset and suspend pending state when it was in local suspend state. The sender shall start the timer Timer_RST and
increase VT(RST) with 1. The RESET PDU shall be transmitted on the DCCH logical channel if the sender is located in
the control plane and on the DTCH if it is located in the user plane.

The RESET PDU has higher priority than data PDUs.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same
RSN value as in the corresponding RESET PDU, i.e., a reset procedure is not interrupted by the reception of a RESET
PDU from the peer entity.

11.4.2.1 RESET PDU contents to set

The size of the RESET PDU shall be equal to one of the allowed PDU sizes. The hyper frame number indicator field
(HFNI) shall be set equal to the currently used HFN (DL HFN when the RESET is sent by UTRAN or UL HFN when
the RESET is sent by the UE). The RSN field shall indicate the sequence number of the RESET PDU. This sequence
number is incremented every time a new RESET PDU is transmitted, but not when a RESET PDU is retransmitted.

11.4.3 Reception of the RESET PDU by the receiver

Upon reception of a RESET PDU the receiver shall respond with a RESET ACK PDU. The receiver resets the state
variables in 9.4 to their initial value and resets configurable parameters to their configured value. Both the transmitter
and receiver side of the AM RLC entity are reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC
SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded.

When a RESET PDU is received, the receiver shall set the HFN (DL HFN when the RESET is received in UE or UL
HFN when the RESET is received in UTRAN) equal to the HFNI field in the received RESET PDU.

The RESET ACK PDU shall be transmitted on the DCCH logical channel if the sender is located in the control plane
and on the DTCH if it is located in the user plane.

The RESET ACK PDU has higher priority than data PDUs.

11.4.3.1   RESET ACK PDU contents to set

The size of the RESET ACK PDU shall be equal to one of the allowed PDU sizes. The RSN field shall always be set to the same value as in the corresponding RESET PDU. The hyper frame number indicator field (HFNI) shall be set equal to the currently used HFN (DL HFN when the RESET ACK is sent by UTRAN or UL HFN when the RESET ACK is sent by the UE).

11.4.4   Reception of the RESET ACK PDU by the sender

When the sender is in reset pending state or reset and suspend pending state and receives a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU the Timer_RST shall be stopped and the value of the HFN (DL HFN when the RESET ACK is received in UE or UL HFN when the RESET ACK is received in UTRAN) shall be set equal to the HFNI field in the received RESET ACK PDU. The sender resets the state variables in 9.4 to their initial value and resets configurable parameters to their configured value. Both the transmitter and receiver side of the AM RLC entity is reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded.

The sender shall enter data transfer ready state if it was in reset pending state and enter local suspend state if it was in reset and suspend pending state.

Upon reception of a RESET ACK PDU with a different RSN value as in the corresponding RESET PDU the RESET ACK PDU is discarded.

Upon reception of a RESET ACK PDU in data transfer ready state or local suspend state, the RESET ACK PDU is discarded.

11.4.5   Abnormal cases

11.4.5.1   Timer_RST timeout

Upon expiry of Timer_RST the sender shall retransmit the RESET PDU and increase VT(RST) with 1. In the retransmitted RESET PDU the value of the RSN field shall not be incremented.

11.4.5.2   Unrecoverable error (VT(RST) ≥ MaxRST)

If VT(RST) becomes larger or equal to MaxRST, unrecoverable error shall be indicated to higher layer.

11.4.5.3   Reception of the RESET PDU by the sender

Upon reception of a RESET PDU in acknowledged data ready state, reset pending state, local suspend state or reset and suspend pending state, the sender shall respond with a RESET ACK PDU. The sender resets the state variables in 9.4 to their initial value, resets configurable parameters to their configured value. However, VT(RST) and Timer_RST are not reset. Both the transmitter and receiver side of the AM RLC entity are reset. All RLC PDUs in the AM RLC receiver shall be discarded. The RLC SDUs in the AM RLC transmitter that were transmitted before the reset shall be discarded. The hyper frame number, HFN (DL HFN when the RESET is received in UE or UL HFN when the RESET is received in UTRAN) is set equal to the HFNI field in the received RESET PDU. The sender shall stay in the reset pending its current state. The sender shall enter data transfer ready state or local suspend state only upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU when it is in reset pending state or reset and suspend pending state respectively.